

Serial No. 09/981,161
Docket No. NEC N01293
Amendment E under Rule 116

AMENDMENTS TO THE SPECIFICATION:

Please amend the title beginning at page 1, line 1, as follows:

ORGANIC ELECTROLUMINESCENCE DEVICE AND METHOD FOR
MANUFACTURING SAME INCLUDING OXYGEN IN AN INTERFACE BETWEEN
ORGANIC LAYER AND CATHODE

Please amend the paragraph bridging pages 1 and 2, beginning at page 1, line 24, as follows:

As shown in Fig. 10, the general organic EL device includes a transparent insulating substrate 51 made of a glass substrate or a like, device main components having an anode 52 (lower electrode) made of a transparent conductive material such as ITO (Indium Tin Oxide) formed on the transparent insulating substrate 51, a hole transporting layer 53 formed on the anode 52, an organic light emitting layer 54 formed on the hole transporting layer 53, a cathode 55 (upper electrode) made of AlLi (aluminum lithium) or a like formed on the organic light emitting layer 54, and a cap 57 made of glass or a like mounted, with encapsulating resin 56 interposed between the transparent insulating substrate 51 and the cap 57, on the transparent insulating substrate 51 so as to cover the main components formed on the transparent insulating substrate 51. As the encapsulating resin 56, for example, a UV (Ultra-violet rays) curable resin is used. By applying light containing UV fed from a light source to the encapsulating resin 56, the encapsulating resin 56 is cured so as to carry out encapsulation.

Please amend the paragraph beginning at page 2, line 13, as follows:

Since a state at an interface between the organic light emitting layer 54 and the cathode 55 is not perfect, an unstable defect exists. That is, the defect here represents an impurity (cvc)

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caused by a lattice defect or a like existing at a place where an interface level should be formed. Due to this defect, in addition to a path through which a carrier has to flow originally, another path is produced, which causes occurrence of a leakage current. Furthermore, there is a danger that the cathode 55 is shorted to the ~~anode52~~ anode 52. As a result, properties of the organic EL device become unstable, thus making impossible to obtain a high rectification ratio and, therefore, when the organic EL device is driven in a simple matrix manner, a pixel short and/or crosstalk occur.

Please amend the paragraph bridging pages 2 and 3, beginning at page 2, line 26, as follows:

Here, a perfect state of interface means a state in which there is no level derived from the defect in the interface level at the interface between the organic light emitting layer 54 and the cathode 55 and there is a state in which an electron implantation can be smoothly performed by a heat exciting current, or a state in which a level that can induce a tunnel effect exists in a stable state. In contrast, an imperfect state of the interface means a state in which many interface levels are formed or vanished repeatedly due to the occurrence of the defects, causing variations in implanting characteristics. Therefore, it is necessary for the organic EL device to have the perfect state of the interface between the organic light emitting layer 54 and the cathode 55 and stable interface level. This enables an increase in the leakage current to be inhibited and the short between the ~~cathode55~~ cathode 55 and ~~anode52~~ anode 52 to be avoided, thus the properties of the organic EL device to be made stable.

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Please amend the paragraph beginning at page 3, line 13, as follows:

To solve this problem, an organic EL device is disclosed in, for example, Japanese Laid-open Patent Application No. Hei 11-312580 in which device elements such as the organic light emitting layers or a like are encapsulated in an atmosphere of ~~Oxidative~~ oxidative gas to make stable the characteristic of the organic EL device. The disclosed organic EL device includes, as shown in Fig. 11, a glass substrate 61, an anode 62 made of ITO formed on the glass substrate 61, an organic film 63 having, for example, a stacked layer containing a hole transporting material and a light emitting layer formed on the anode 62, a cathode 64 having a metal consisting of MgAg (magnesium silver) or stacked layers of ~~K₂F~~ LiF (lithium fluoride) and Al (aluminum) on the organic film 63, and an enclosure 66 encapsulating the device elements (that is, the anode 62, organic film 63, and cathode 64) in a manner so as not to stick to the device element using an encapsulating resin 65 made of a UV curable resin or a like.

Please amend the paragraph beginning at page 12, line 6, as follows:

First, as shown in Fig. 2A, the ITO film having a thickness of about 150 nm, as a transparent conductive film, is formed, by a sputtering method, on the transparent insulating substrate 1 made of a sufficiently cleaned glass substrate or a like. Then, after the anode 2 has been formed by performing patterning operations on the ITO film using a photolithography method so that a light emitting area of the organic EL device 10 is ~~2 mm~~ 2 mm², the transparent insulating substrate 1 and the anode 2 are cleaned using IPA (Iso-Propyl Alcohol) and pure water and then ultrasonic cleaning is performed using the IPA followed by cleaning with a UV ozone cleaner to remove residual organic substances from surfaces of the transparent insulating substrate 1 and the anode 2.

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Please amend the paragraph beginning at page 17, line 5, as follows:

Next, by using a semiconductor parameter analyzer, rectification properties of the organic EL device 10 manufactured by the method for manufacturing the organic EL device 10 of the embodiment are measured. The measurements are made by applying a forward voltage and a reverse voltage between the anode 2 and the second cathode 5B of the organic EL device 10. An area of light emitting is ~~2 mm~~ 2 mm^2 .

Please amend the paragraph beginning at page 21, line 5, as follows:

On the other hand, in Fig. 9, item No. 1 in the table shows a case where the film thickness of the cathode is set at 10 nm and the obtained rectification ratio is 1.0×10^5 . Similarly, item No. 2 shows a case where the film thickness of the cathode is set at 200 nm and the obtained rectification ratio is 6.9×10^3 . Item No. 3 shows a case where the film thickness of the cathode is set at 300 nm and the obtained rectification ratio is 4.2×10^2 . Item No. 4 shows a case where the film thickness of the cathode is set at ~~500 nm~~ 500 nm and the obtained rectification ratio is 5.2×10^2 . The above rectification ratios are remarkably smaller than those shown in Fig. 8, indicating that the rectification properties have been degraded.

Please amend the paragraph beginning at page 23, line 6, as follows:

It is apparent that the present invention is not limited to the above embodiments but may be changed and modified without departing from the scope and spirit of the invention. For example, in the above embodiment, as the material for the anode 2 to be formed on the transparent insulating substrate 1, ITO is used, however, other materials for the electrode such as SnO_2 (~~thin tin~~ tin dioxide) or a like may be employed. It is preferable but not necessarily limited to a transparent conductive material.

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Please amend the paragraph beginning at page 23, line 14, as follows:

It is possible to use a non-transparent insulating substrate instead of the transparent insulating substrate. Moreover, as the cathode, other materials for the electrode including not only AlLi but also Al, MgAg or like may be used. Furthermore, as the materials for the hole transporting layer 3, other materials including not only the α -NPD but also bis(di (p-tolyl) aminophenyl)-1, 1-cyclohexane, N,N'-diphenyl-N, N'-bis (3-methylphenyl) -1,1'-bisphenyl-4, 4'-diamine, N,N'-diphenyl-N-N-bis (1-naphthyl) - (1,1'-bisphenyl) -4, 4' - diamine, a star-burst type molecule or a like may be used.

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